

1. - 12. (Cancelled).

13. (Amended) A semiconductor package, comprising:

a metal lead frame, including a plurality of elongate leads arrayed around a central region thereof, each lead having an outer end extending away from the central region and an inner end extending toward the central region;

a spatulate locking pad in an outer portion of each lead adjacent to its outer end;

a spatulate wire bonding pad in an inner portion of each lead adjacent to its inner end;

a land defined on a lower surface of each lead between the locking pad and the bonding pad; and,

a die pad attached to the leadframe in the central region thereof and adjacent to the inner ends of the leads, the die pad having an upper surface and a lower surface, the lower surface having a central portion and a recessed shoulder extending around the central portion.

14. The semiconductor package of claim 13, wherein the die pad is attached to the frame or to at least one of the leads by at least one tie-bar.

15. The semiconductor package of claim 13, wherein each of the leads is about 0.18 mm wide, and wherein the leads have a pitch of about 0.5 mm.

16. The semiconductor package of claim 15, wherein each of the bonding pads is about 0.254 mm wide.

17. The semiconductor package of claim 13, wherein the lands are rectangular.

18. The semiconductor package of claim 13, further comprising:

a semiconductor die attached to the upper surface of the die pad;

a plurality of conductive wires bonded at opposite ends to pads on a top surface of the die and selected ones of the bonding pads on the leads, respectively; and,

a body of an insulative plastic molded over the die, the die pad, and the leads such that

that portion of the lower surface of the die pad are exposed through a lower surface thereof.

19. The semiconductor package of claim 13, wherein the leadframe comprises an al-

uminum-copper alloy having a copper content of 0.5 to 1.0 percent.

20. The semiconductor package of claim 18, wherein the insulative plastic of the body comprises an epoxy resin.

21. A lead frame for a semiconductor package, comprising:

a plurality of elongate metal leads arrayed around a central region, each lead having an outer end extending away from the central region and an inner end extending toward the central region;

a spatulate pad formed into the inner and outer ends of each lead;

a land defined on a lower surface of each lead by and between the spatulate pads formed into the inner and outer ends thereof; and,

a disposable frame connected to the leads.

22. The leadframe of claim 21, further comprising a die pad disposed in the central region and adjacent to the inner ends of the leads, the die pad having a recessed shoulder extending around a periphery of a lower surface thereof.

23. A semiconductor package of a type that includes a ductile metal lead frame having a plurality of elongate leads radiating out from a central die pad, a semiconductor die mounted on the pad, a plurality of wire bonds connecting the die to the leads, and a protective plastic body molded over the leads, the pad, the die, and the wire bonds, the improvement in combination therewith comprising:

a spatulate wire bonding pad formed into an inner portion of each lead and adjacent to the die pad; and,

a spatulate locking pad formed into an outer portion of each lead and intersecting with a side wall of the plastic body.

24. The semiconductor package of claim 23, wherein the wire bonds are connected to the wire bonding pads.

25. The semiconductor package of claim 23, further comprising a land defined on a

26. The semiconductor package of claim 23, further comprising a recessed shoulder formed into a peripheral portion of a lower surface of the die pad such that a central portion of the lower surface inside of the shoulder is exposed through a lower surface of the plastic body

27. The semiconductor package of claim 23, wherein the leads, the die pad, and the spatulate pads have coplanar upper surfaces.

28. (Amended) A semiconductor package of a type that includes a ductile metal lead-frame having a plurality of elongate leads radiating out from a central die pad, a semiconductor die mounted on the pad, a plurality of wire bonds connecting the die to the leads, and a protective plastic body molded over the leads, the pad, the die, and the wire bonds, the improvement in combination therewith comprising:

a spatulate locking pad formed into an outer portion of each lead and intersecting with a side wall of the plastic body.

29. (Cancelled).

30. The semiconductor package of claim 28, further comprising:

means formed into an inner portion of each lead and adjacent to the die pad for increasing the wire bonding area on the lead.

31. The semiconductor package of claim 30, wherein the means for increasing the wire bonding area comprises a spatulate pad formed into the inner portion of the lead.

32. The semiconductor package of claim 28, further comprising means formed into a lower surface of the die pad for resisting penetration of moisture into the package along the die pad.

33. The semiconductor package of claim 32, wherein the means for resisting penetration of moisture comprises a recessed shoulder formed into the lower surface of the die pad around a periphery thereof, a middle portion of the lower surface being exposed through a lower surface of the plastic body.

34. (New) The semiconductor package of claim 13, wherein at least one of the spatulate locking pads, the spatulate wire bonding pads, and the recessed shoulder is formed by a

35. (New) The semiconductor package of claim 18, wherein the insulative plastic body underfills each of the spatulate pads.

JOHN S. MORRIS
J. PETERSON
J. M. GILBERT
J. L. GILBERT
J. L. GILBERT
J. L. GILBERT
J. L. GILBERT

36. (New) The lead frame of claim 21, wherein the spatulate pads are formed by a metal-displacement process.

37. (New) A semiconductor package of a type that includes a metal lead frame having a plurality of elongate leads radiating out from a central region thereof, the leads having inner portions adjacent to the central region and outer portions distal therefrom, a semiconductor die mounted in the central region, and a protective plastic body molded over the leads and the die, the improvement in combination therewith comprising at least one spatulate locking pad formed in at least one of the leads, the at least one spatulate locking pad being underfilled by the plastic body.

38. (New) The semiconductor package of claim 37, wherein the at least one spatulate pad is formed in the outer portion of the at least one lead.

39. (New) The semiconductor package of claim 38, wherein the at least one spatulate pad is formed adjacent to a side wall of the plastic body.

40. (New) The semiconductor package of claim 37, wherein the at least one spatulate pad is formed in the inner portion of the at least one lead.

41. (New) The semiconductor package of claim 37, wherein at least some of the leads have a plurality of the spatulate pads formed therein.

42. (New) The semiconductor package of claim 37, further comprising a die pad disposed in the central region, the die pad having opposite first and second surfaces, the semiconductor die being mounted on the first surface of the die pad, the second surface of the die pad including a recessed shoulder extending fully around a periphery thereof, and the second surface of the die pad being exposed through and flush with an exterior surface of the plastic body such that the recessed shoulder is underfilled by the plastic body.

43. (New) The semiconductor package of claim 41, wherein the at least some leads

44. (New) The semiconductor package of claim 37, wherein the at least one spatulate pad is formed by a metal-displacement process.

45. (New) The semiconductor package of claim 43, further comprising a die pad in the central region and upon which the die is mounted, wherein the die pad includes a recessed shoulder extending fully around a periphery of a surface thereof, and wherein a surface of the die pad within the recessed shoulder is exposed in a plane of an exterior surface of the plastic body, the recessed shoulder being underfilled by the plastic body.

REMARKS

As a result of a previous restriction requirement and reply thereto, twenty-one apparatus claims (13-33) were pending in this Application. In the above Amendment, one claim (29) was cancelled, one claim (28) was amended, and twelve new claims (34-45) were added. Accordingly, thirty-two claims (13-28 and 30-45) are presented for further consideration and examination. This Amendment adds no new matter.

In paragraphs 1 and 2 of the Office Action, the Examiner rejected claims 13-14, 17-18, and 20-33 under 35 U.S.C. 102(a) as being anticipated by Okumura et al. (US. 6,130,115), stating, in pertinent part:

"In regards to claims 13, 21, 22, 23, figs. 1-4, Okumura et al. discloses a semiconductor package comprising a metal lead frame, ...
a plurality of leads 13 and 16 ...;
a locking pad 16 in an outer portion of each lead adjacent to outer end,
a wire bonding pad ... in an inner portion of each lead ...; and,
a die pad 11 ... having ... a lower surface [with] a recessed shoulder extending around the central portion.

In regards to claim 14, the die pad is attached ... by at least one tie-bar 10

In regards to claim 17, the lands 16 are rectangular

In regards to claims 18, 24, ... Okumura further discloses a semiconductor die 12 ...;

a plurality of conductive wires 14 ...; and,

a body insulative plastic molded over the die 12, die pad 11, and the leads 13

In regards to claim 20, see col. 16, second paragraph.

In regards to claim 25, see fig. 7b.

In regards to claims 26 and 33, Okumura et al, further discloses a recessed shoulder at the lower surface of the die pad 11 such that a central portion of the lower surface inside the shoulder is exposed through a lower surface of the plastic body

In regards to claim 27, see figs. 7

In view of the above Amendment, and the Remarks that follow, this rejection is respectfully traversed.